US009091386B2

(12) **United States Patent**
Bentz et al.

(10) **Patent No.: US 9,091,386 B2**
(45) **Date of Patent: Jul. 28, 2015**

(54) **MOUNTING SYSTEM WITH INCORPORATED WIRELESS SYSTEM FOR USE WITH AUDIO/VISUAL DEVICES OR THE LIKE**

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(73) Assignee: **Peerless Industries, Inc.**, Aurora, IL (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 325 days.

(21) Appl. No.: **13/484,950**

(22) Filed: **May 31, 2012**

(65) **Prior Publication Data**

US 2012/0320506 A1 Dec. 20, 2012

Related U.S. Application Data

(60) Provisional application No. 61/496,822, filed on Jun. 14, 2011, provisional application No. 61/532,453, filed on Sep. 8, 2011.

(51) **Int. Cl.**

H05K 5/00	(2006.01)
H05K 7/00	(2006.01)
G06F 1/16	(2006.01)
F16M 13/02	(2006.01)
F16M 11/08	(2006.01)
F16M 11/20	(2006.01)

(52) **U.S. Cl.**

CPC ***F16M 13/02*** (2013.01); ***F16M 11/08*** (2013.01); ***F16M 11/2014*** (2013.01); ***F16M 13/027*** (2013.01); ***G06F 1/1607*** (2013.01); ***G06F 1/1626*** (2013.01); ***G06F 1/1632*** (2013.01)

(58) **Field of Classification Search**

CPC ... G06F 1/1601; G06F 1/1607; G06F 1/1626; G06F 1/1632; F16M 13/02; F16M 13/022; F16M 13/027

USPC 361/679.21, 679.41; 248/917–920

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

6,532,152	B1 *	3/2003	White et al.	361/692
D558,562	S	1/2008	Ciungan et al.	
D558,563	S	1/2008	Ciungan et al.	
7,414,831	B1 *	8/2008	Brown et al.	361/679.27
7,487,943	B1	2/2009	Gillespie	
7,641,163	B2	1/2010	O'Keene	
7,753,332	B2	7/2010	O'Keene	
D623,177	S	9/2010	Molter et al.	
7,832,700	B2	11/2010	Ciungan	
7,854,415	B2	12/2010	Holbrook et al.	

(Continued)

OTHER PUBLICATIONS

HD Flow Wireless Multimedia Kit, HDS100, HDS100-X Brochure, Peerless Industries, Inc. 2011.

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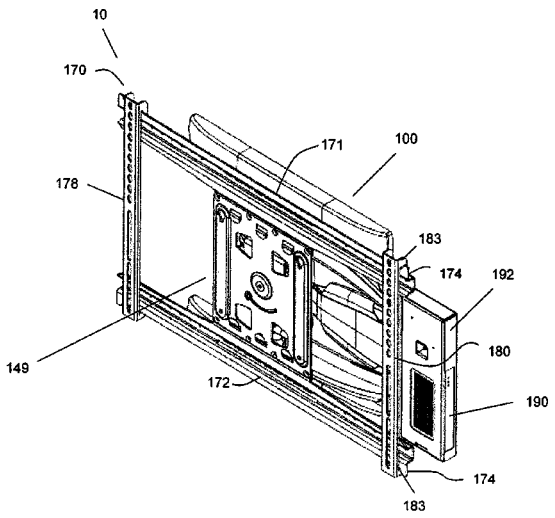
(57) **ABSTRACT**

A mounting system for attaching a device to a surface and housing a wireless receiver for communicating a wireless signal to the device. According to various embodiments, the mounting system includes a surface mount portion, a device mount portion, and a receiver housing assembly. The surface mount portion is configured to attach to the surface and is operatively connected to the device mount portion. The receiver housing is connected to the device mount portion and is sized and configured to house a wireless receiver for receiving and communicating a wireless high definition signal to a device mounted to the mounting system.

18 Claims, 18 Drawing Sheets



(56) **References Cited**

U.S. PATENT DOCUMENTS

7,866,621	B1	1/2011	Walters	
7,869,200	B2 *	1/2011	Horie	361/679.02
7,891,622	B1	2/2011	O'Keene	
7,898,796	B2 *	3/2011	Horie	361/679.02
7,963,489	B2	6/2011	O'Keene et al.	
8,081,429	B2 *	12/2011	Horie	361/679.02
8,094,438	B2 *	1/2012	Dittmer et al.	361/679.01
8,284,549	B2 *	10/2012	Liu	361/679.23
8,508,918	B2 *	8/2013	Dittmer et al.	361/679.01
2005/0047081	A1 *	3/2005	LaPorte et al.	361/686
2009/0174998	A1 *	7/2009	Struthers et al.	361/679.41
2010/0195279	A1 *	8/2010	Michael	361/679.41
2010/0237210	A1 *	9/2010	Anderson et al.	248/274.1
2011/0164368	A1 *	7/2011	Leng	361/679.21

* cited by examiner

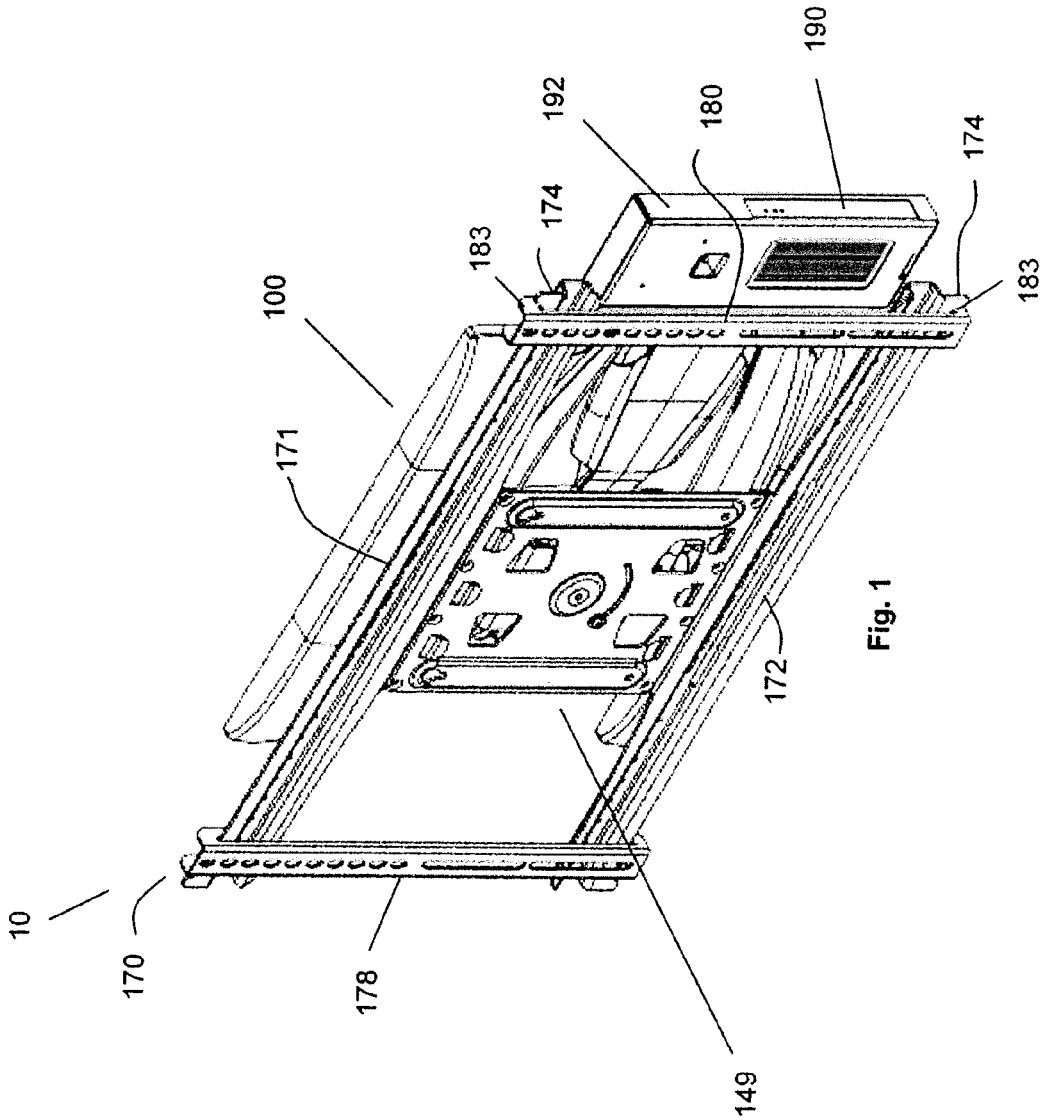


Fig. 1

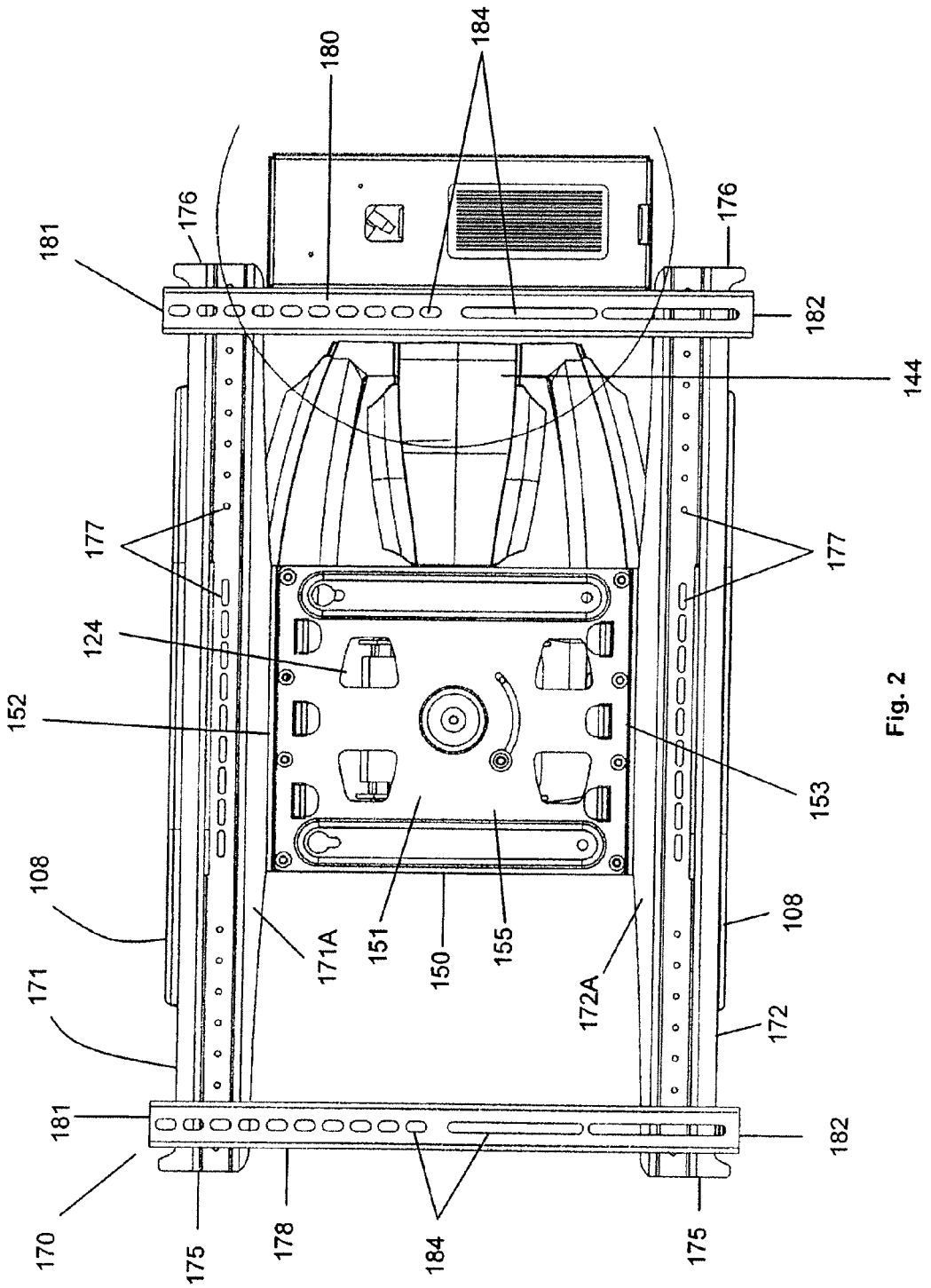

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Fig. 2

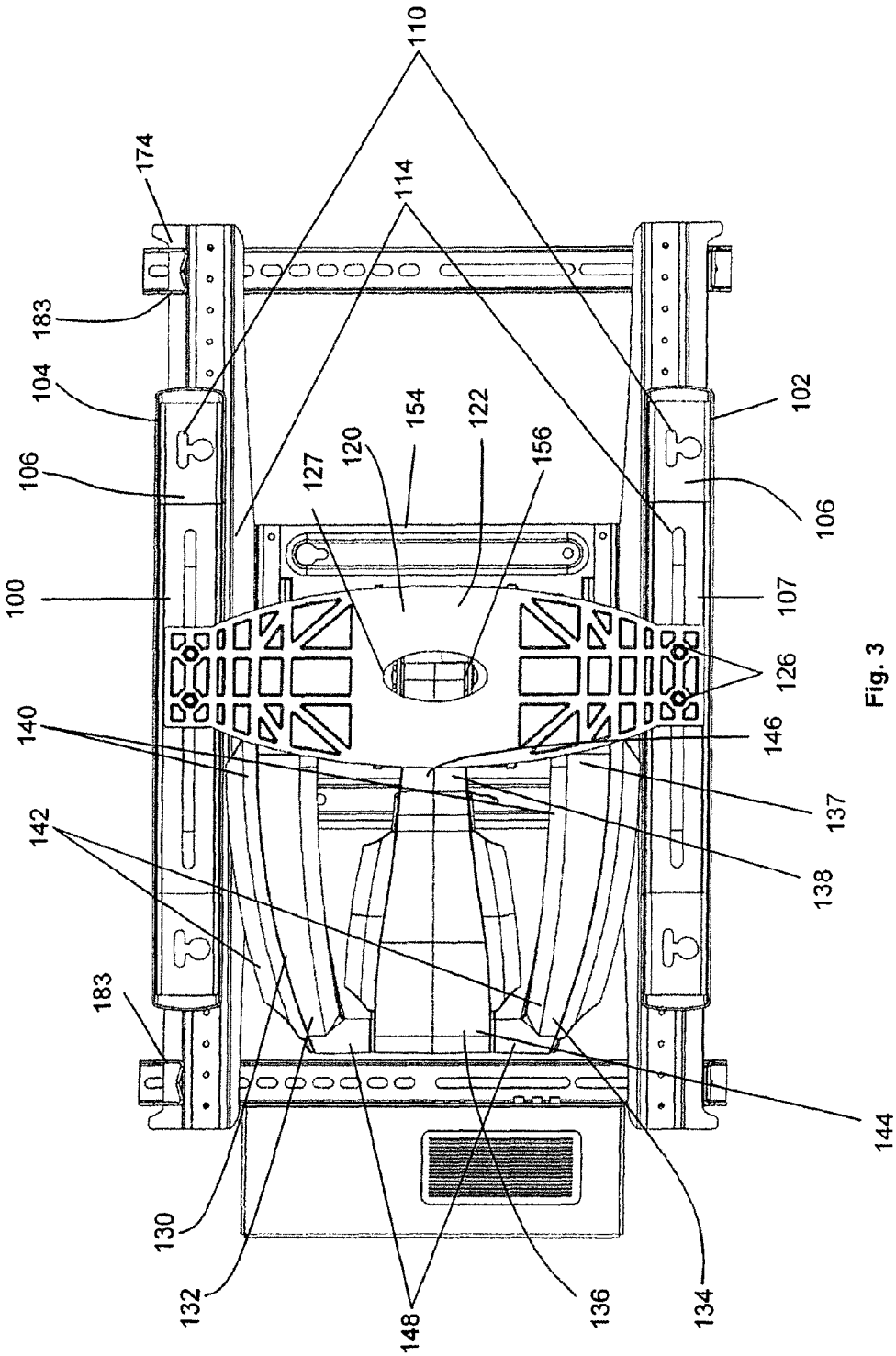
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Fig. 3

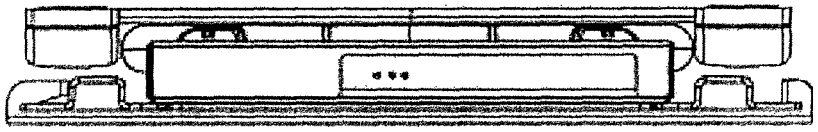

Fig. 5

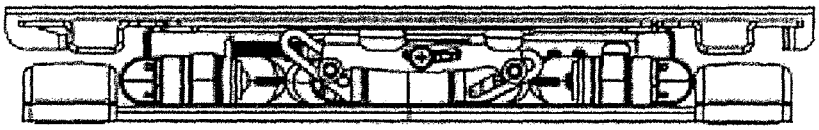

Fig. 4

Fig. 6

Fig. 7

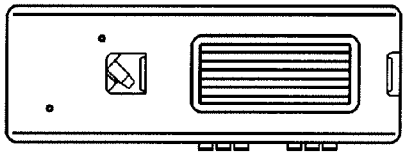

FIG. 8A

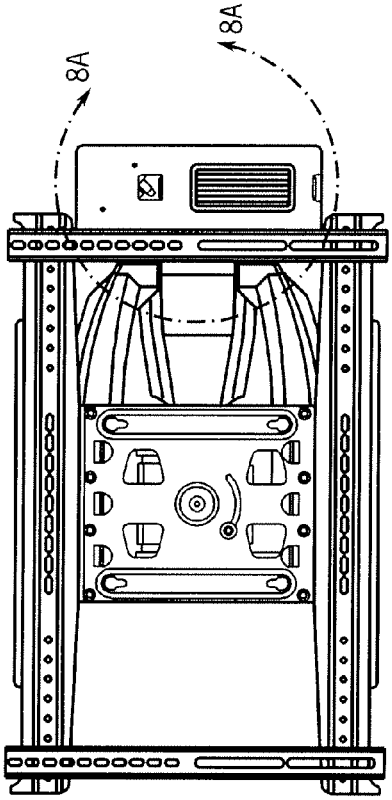

FIG. 8

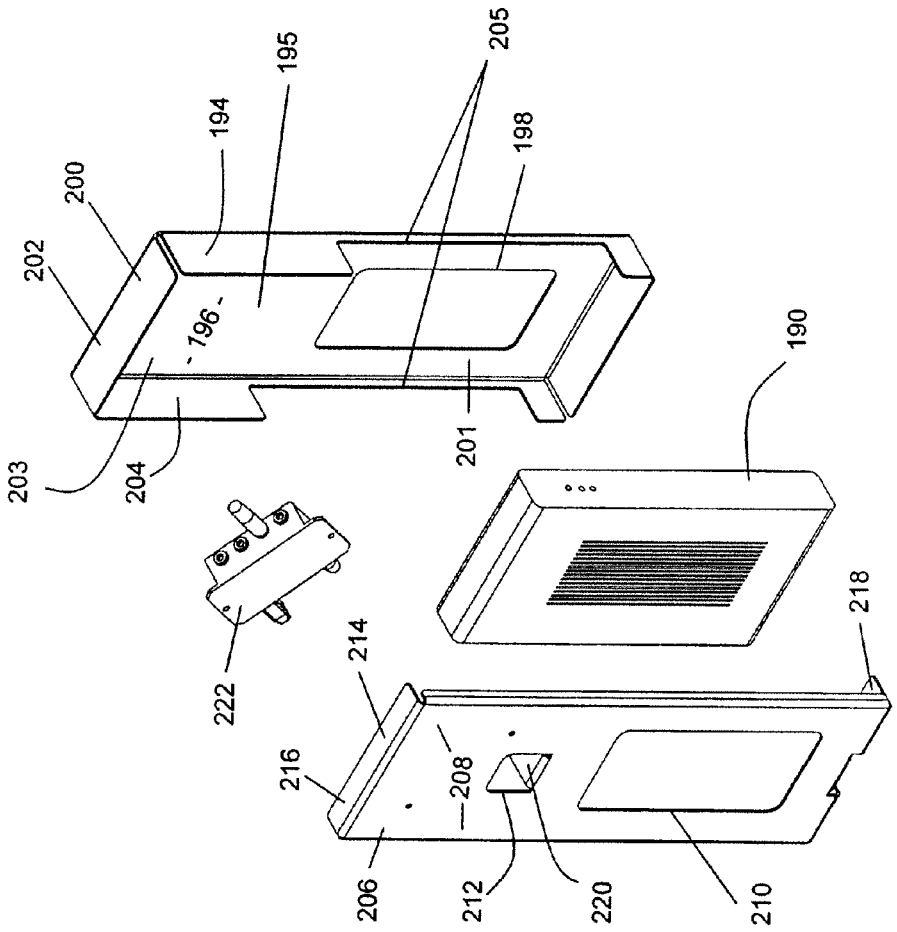
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Fig. 9

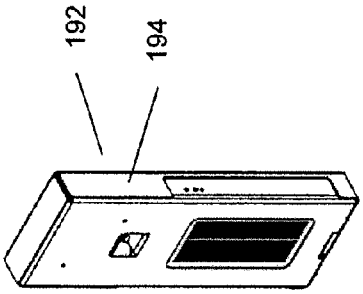


Fig. 10

Fig. 14

Fig. 15

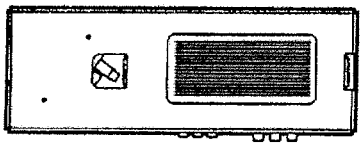


Fig. 11

Fig. 16

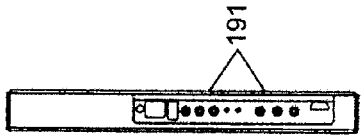


Fig. 13

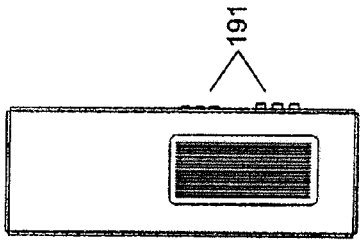


Fig. 12

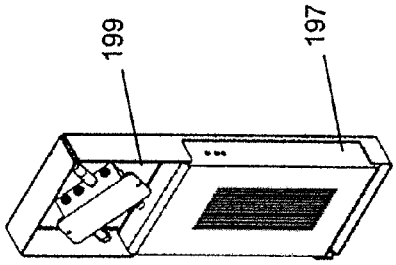


Fig. 17

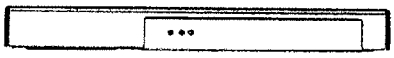


Fig. 21

Fig. 22

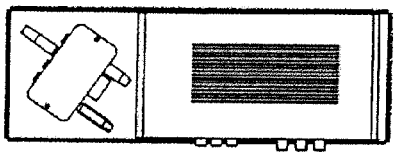


Fig. 18

Fig. 23

Fig. 20

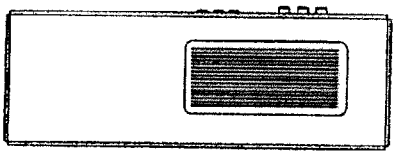


Fig. 19

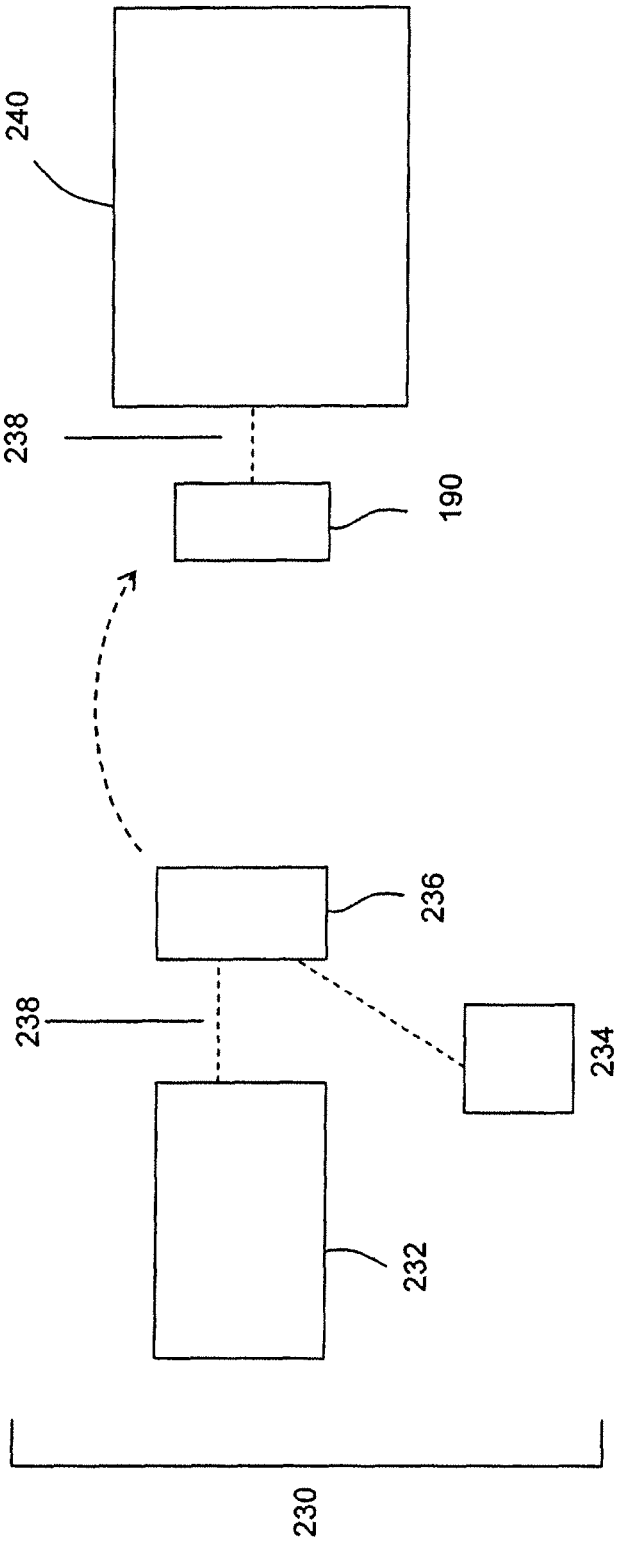


Fig. 24

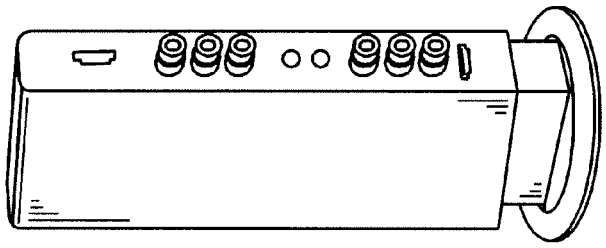


FIG. 25

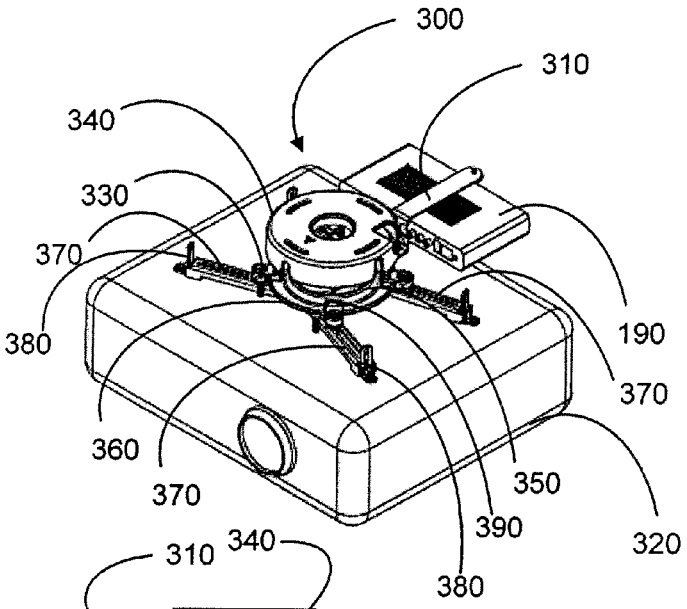


FIG. 26

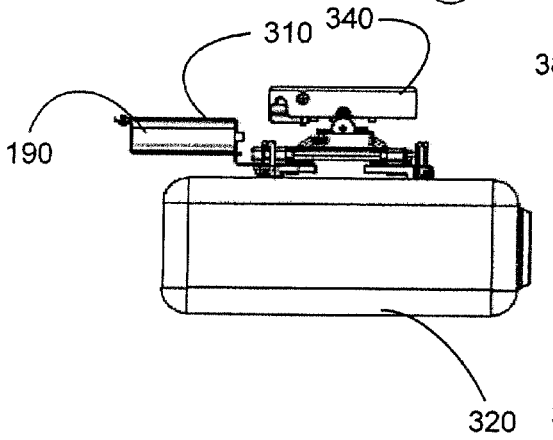


FIG. 27

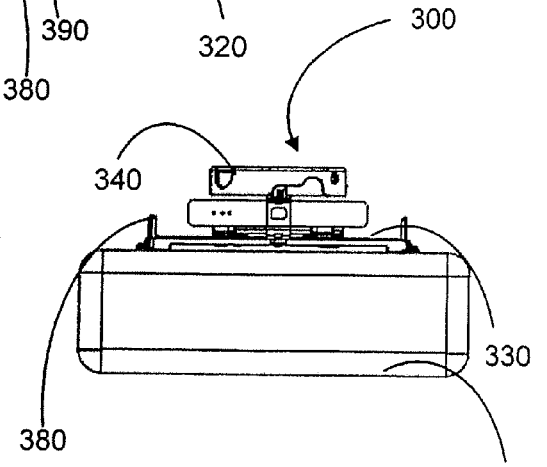


FIG. 28

FIG. 29

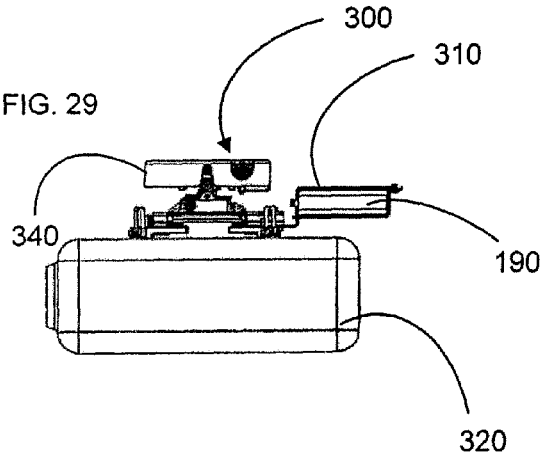
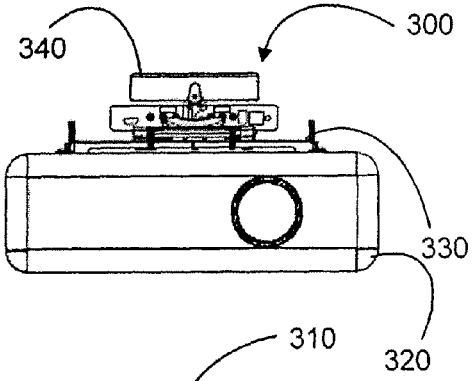


FIG. 30



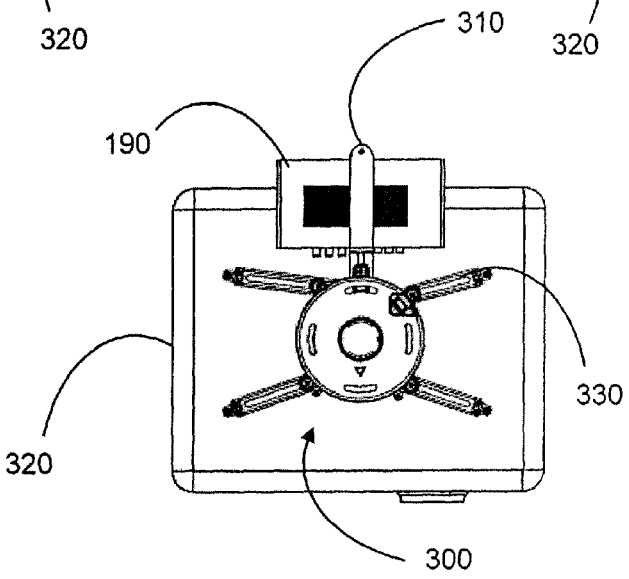
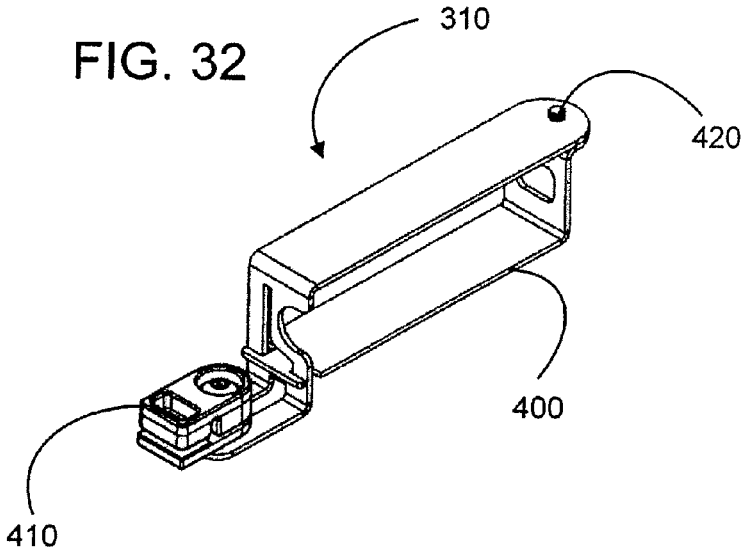


FIG. 31

FIG. 32



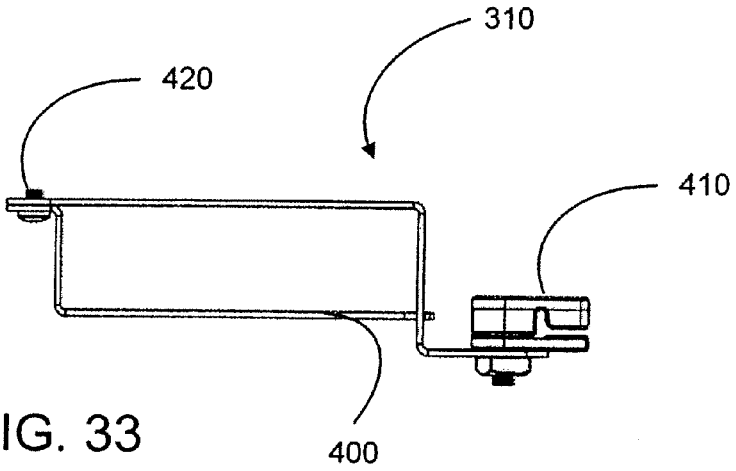


FIG. 33

FIG. 34

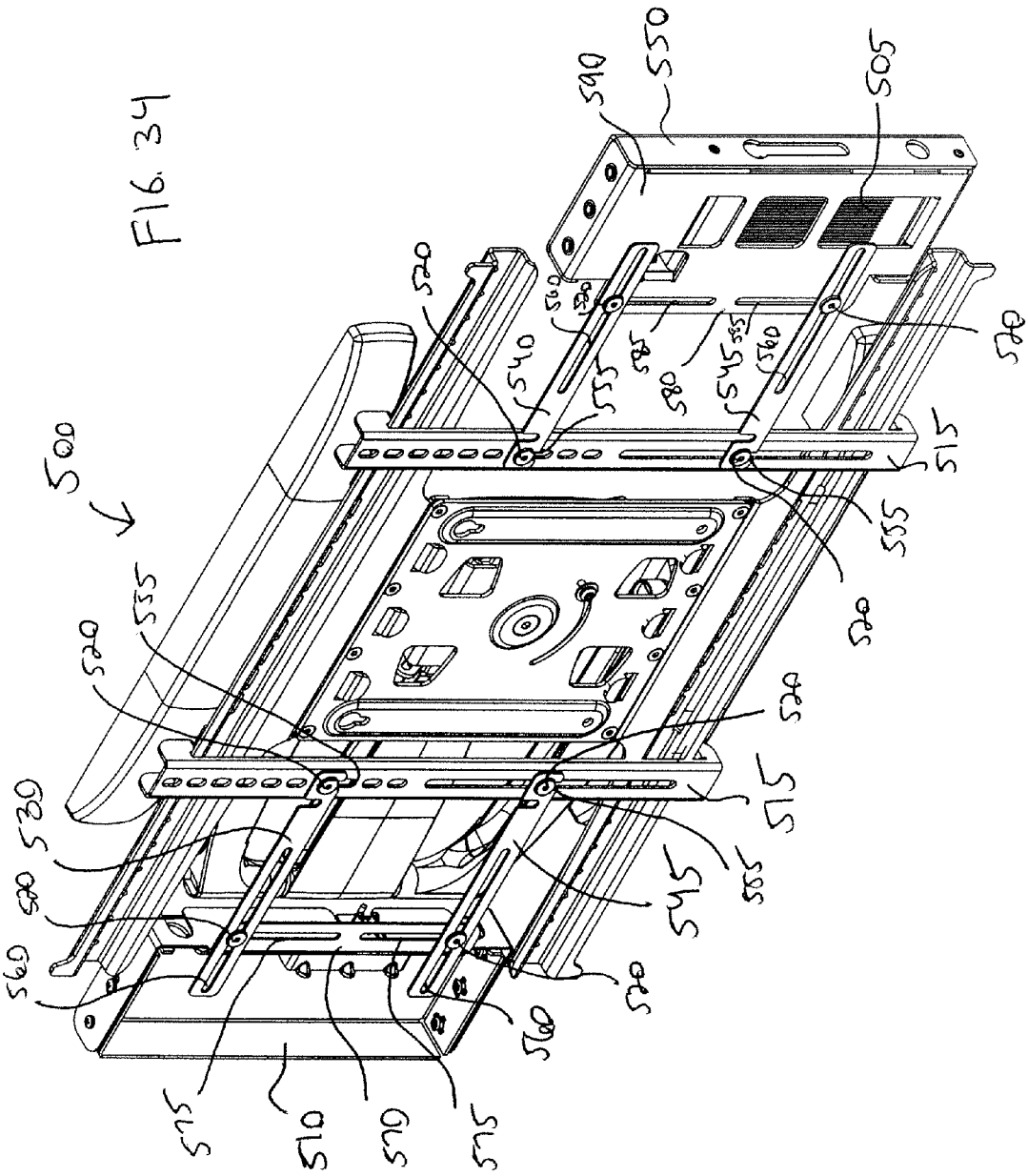

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FIG. 35

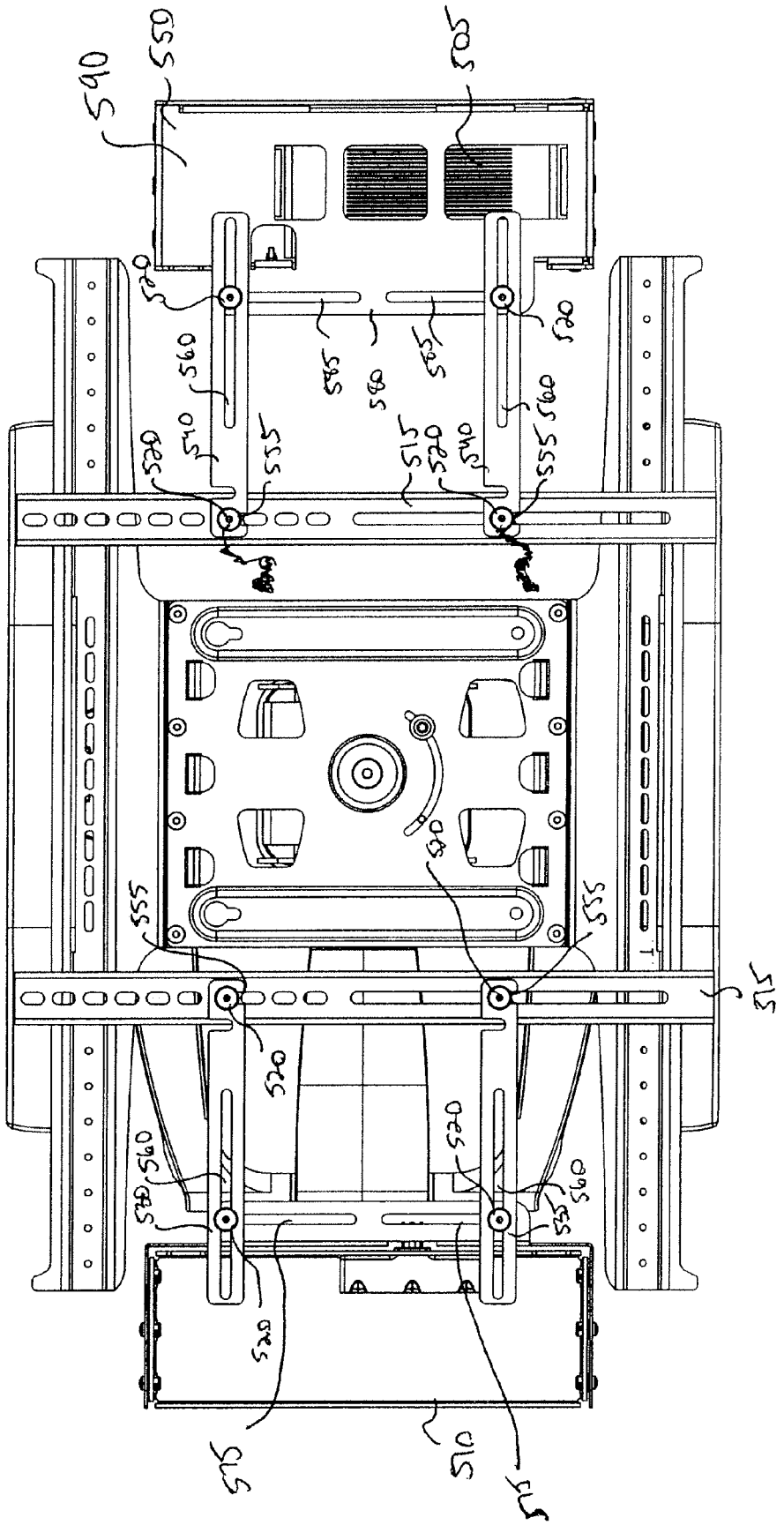


FIG. 3b

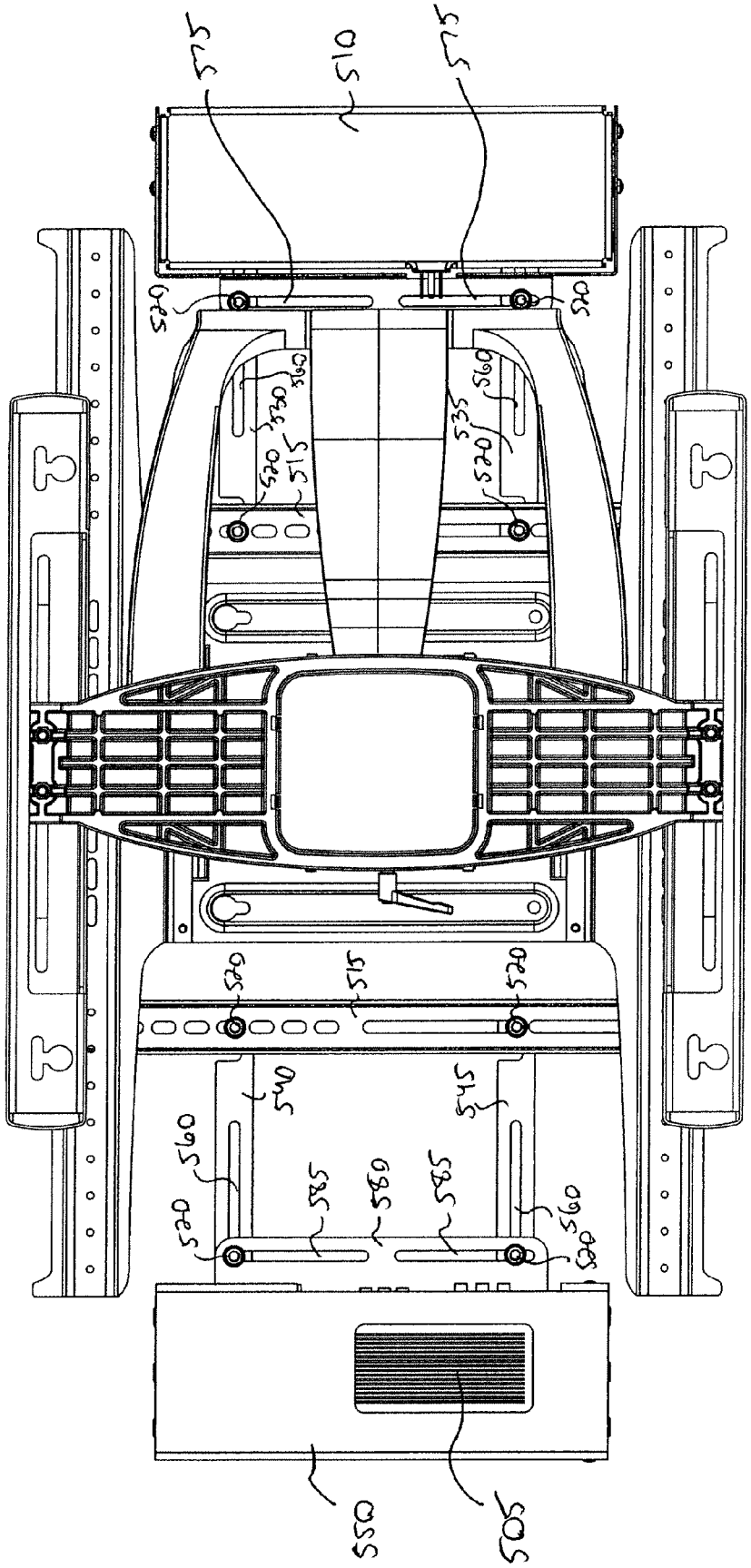
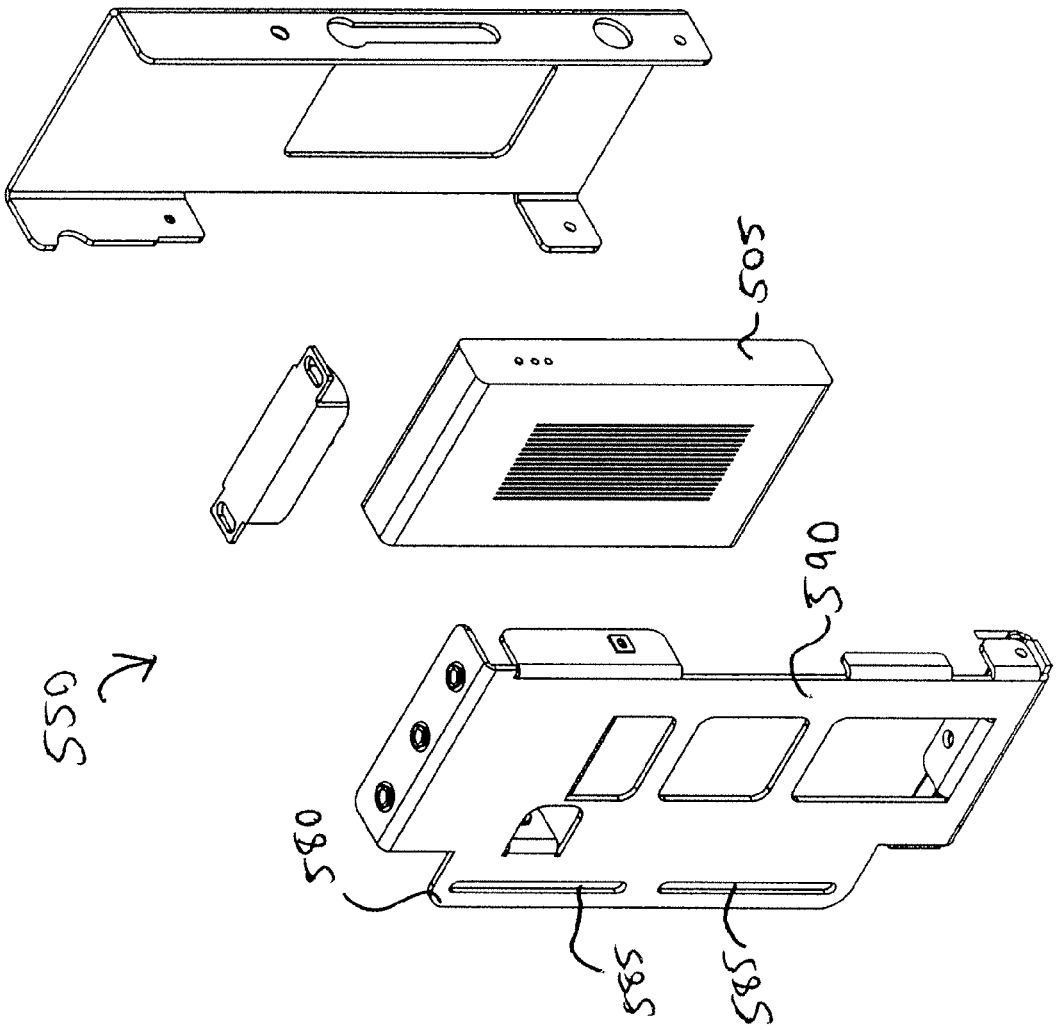


FIG. 37



MOUNTING SYSTEM WITH INCORPORATED WIRELESS SYSTEM FOR USE WITH AUDIO/VISUAL DEVICES OR THE LIKE

CROSS-REFERENCE TO RELATED APPLICATIONS

The present application claims priority to U.S. Provisional Patent Application No. 61/496,822, entitled "Mounting System With Incorporated Wireless System for Use With Audio/Visual Devices or the Like" and filed Jun. 14, 2011. The present application also claims priority to U.S. Provisional Patent Application No. 61/532,453, entitled "Mounting System With Incorporated Wireless System for Use With Audio/Visual Devices or the Like" and filed Sep. 8, 2011. The contents of these applications are incorporated herein by reference in their entirety.

FIELD OF INVENTION

The present invention relates generally to mounting systems. More particularly, the present invention relates to mounting systems for flat panel displays.

BACKGROUND

This section is intended to provide a background or context to the invention that is recited in the claims. The description herein may include concepts that could be pursued, but are not necessarily ones that have been previously conceived or pursued. Therefore, unless otherwise indicated herein, what is described in this section is not prior art to the description and claims in this application and is not admitted to be prior art by inclusion in this section.

In recent years, flat panel televisions have become enormously popular in both commercial and residential sectors. As the prices for plasma and liquid crystal display ("LCD") flat panel displays have continued to fall, and the quality for the same devices have improved, more and more businesses and individuals have purchased such devices for both home and business purposes.

One of the advantages of flat panel display devices that customers have found particularly appealing is their relatively low thickness. Because conventional "tube" televisions have a relatively large depth, the placement options for such devices are quite limited. In the residential setting, most users require a television stand or large entertainment center to house the television. Such stands or entertainment centers can take up significant floor space, which is often undesirable. In the commercial or educational setting, users will often install large overhead mounting systems that can contain the television. However, these systems usually require professional installation and, once the television is secured to the mount, it is often difficult to access and adjust due to its height. With flat panel televisions, on the other hand, users are presented with a relatively new option: mounting the television directly to a mounting surface such as a wall. By mounting the television to the wall, the user can eliminate consumption of potentially valuable floor space.

Although the introduction of flat panel display devices on a wide scale has presented new opportunities to both residential and commercial customers, it has also presented new challenges. In particular, mounting a flat panel television directly to a mounting surface such as a wall presents issues for neatly and discreetly routing power cords and input cables to the television. For example, typical wall-mount installations include a television being mounted to a wall and a media source located a distance from the television. Thus, the input cables often must be routed across a wall from the media source to the television. One way to solve this routing issue is to route the input cables through the wall. However, this is a costly and time-consuming option.

SUMMARY

One embodiment provides for a mounting system for attaching an audio/visual device, such as a flat panel display, to a surface and housing a wireless receiver for communicating a wireless signal to the device. The mounting system comprises a surface mount portion, a device mount portion, and a receiver housing assembly. The surface mount portion is configured to attach to the surface and is operatively connected to the device mount portion. The receiver housing assembly is operatively connected to the device mount portion and is sized and configured to house a wireless receiver for receiving and communicating a wireless high definition signal to the device mounted to the mounting system.

These and other features of the invention, together with the organization and manner of operation thereof, will become apparent from the following detailed description when taken in conjunction with the accompanying drawings, wherein like elements have like numerals throughout the several drawings described below.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of a mounting system constructed in accordance with an embodiment of the present invention;

FIG. **2** is a front elevational view of the mounting system of FIG. **1**;

FIG. **3** is a rear elevational view of the mounting system of FIG. **1**;

FIG. **4** is a left side elevational view of the mounting system of FIG. **1**;

FIG. **5** is a right side elevational view of the mounting system of FIG. **1**;

FIG. **6** is a top plan view of the mounting system of FIG. **1**;

FIG. **7** is a bottom plan view of the mounting system of FIG. **1**;

FIG. **8** is another front elevational view of the mounting system of FIG. **1**, including a call-out to a receiver housing assembly, and FIG. **8**A is another front elevational view of the receiver housing assembly of FIG. **8**;

FIG. **9** is an exploded view of a receiver housing assembly;

FIG. **10** is a perspective view of an assembled receiver housing assembly;

FIG. **11** is a front elevational view of the assembled receiver housing assembly of FIG. **10**;

FIG. **12** is a rear elevational view of the receiver housing assembly of FIG. **10**;

FIG. **13** is a left side elevational view of the receiver housing assembly of FIG. **10**;

FIG. **14** is a right side elevational view of the receiver housing assembly of FIG. **10**;

FIG. **15** is a top plan view of the receiver housing assembly of FIG. **10**;

FIG. **16** is a bottom plan view of the receiver housing assembly of FIG. **10**;

FIG. **17** is a perspective view of a partially assembled receiver housing assembly;

FIG. **18** is a front elevational view of the partially assembled receiver housing assembly of FIG. **17**;

FIG. **19** is a rear elevational view of the partially assembled receiver housing assembly of FIG. **17**;

FIG. **20** is a left side elevational view of the partially assembled receiver housing assembly of FIG. **17**;

FIG. **21** is a right side elevational view of the partially assembled receiver housing assembly of FIG. **17**;

FIG. **22** is a top plan view of the partially assembled receiver housing assembly of FIG. **17**;

FIG. **23** is a bottom plan view of the partially assembled receiver housing assembly of FIG. **17**;

FIG. **24** illustrates an exemplary representation of a wireless communication system;

FIG. **25** illustrates an exemplary representation of a wireless receiver;

FIG. **26** is a perspective view of an exemplary projector mount assembly, coupled to a projector, constructed in accordance with an embodiment of the present invention;

FIG. **27** is a left side elevational view of the projector mount assembly and projector of FIG. **26**;

FIG. **28** is a rear elevational view of the projector mount assembly and projector of FIG. **26**;

FIG. **29** is a right side elevational view of the projector mount assembly and projector of FIG. **26**;

FIG. **30** is a front elevational view of the projector mount assembly and projector of FIG. **26**;

FIG. **31** is a top plan view of the projector mount assembly and projector of FIG. **26**;

FIG. **32** is a perspective view of wireless receiver bracket assembly for use in the projector mount assembly depicted in FIGS. **26-31**;

FIG. **33** is a left side view of the wireless receiver bracket assembly of FIG. **32**;

FIG. **34** is an isometric view of a mounting system constructed in accordance with still another embodiment;

FIG. **35** is a front elevational view of the mounting system of FIG. **34**;

FIG. **36** is a rear elevational view of the mounting system of FIG. **34**; and

FIG. **37** is an exploded perspective view of the receiver housing assembly of the mounting system of FIG. **34**.

DETAILED DESCRIPTION OF VARIOUS EMBODIMENTS

FIGS. **1-3** show a mounting system **10** for attaching a device to a surface and housing a wireless receiver **190** for communicating a wireless signal to the device. In the embodiment depicted in FIGS. **1-3**, the mounting system **10** includes a surface mount portion **100**, a device mount portion **149**, and a receiver housing assembly **192**. The surface mount portion **100** is configured to attach to the surface and is operatively connected to the device mount portion **149**. The receiver housing assembly **192** is operatively connected to the device mount portion **149** and is sized and configured to house a wireless receiver **190** for receiving and communicating a wireless signal to a device mounted to the mounting system **10**.

In one embodiment depicted in FIG. **9**, the receiver housing assembly **192** comprises a receiver housing **194** and a receiver housing lid **206**. The receiver housing **194** comprises a boxed-shaped compartment **195** with a generally flat bottom **196**, a receiver housing opening **198** in the bottom **196**, and a plurality of walls **200** with an outer surface **202** and an inner surface **204**. The receiver housing **194** comprises a first end **201** proximate the receiver housing opening **198** and a second end **203** distal the first end **201**. One or more of the plurality of walls **200** may include one or more cutouts **205**. The receiver housing assembly **192** may also comprise a receiver housing lid **206** having a generally flat top **208** with dimensions substantially similar to the dimensions of the receiver housing **194**. The receiver housing lid **206** further comprises a plurality of tabs **214** with an outer surface **216** and an inner surface **218**, a receiver housing lid opening **210**, a receiver housing aperture **212**, and an aperture tab **220**. The aperture tab **220** extends substantially perpendicular to the flat top **208**, in the same direction as the tabs **214**. As will be appreciated, the receiver housing assembly **192** may be sized to accommodate a wireless receiver **190** of various sizes.

To assemble the receiver housing assembly **192** depicted in FIG. **9**, the receiver housing lid **206** is installed on the receiver housing **194**, such that the tabs **214** are disposed within the receiver housing **194**, adjacent to, and in engagement with, the inner surface **204** of the plurality of walls **200**, forming compartment **195**. When assembled, the aperture tab **220** divides compartment **195** into a first compartment **197**, corresponding to the first end **201** of the receiver housing **194**, and a second compartment **199**, corresponding to the second end **203** of the receiver housing **194**. As depicted in FIG. **9**, the receiver housing lid **206** is retained to the receiver housing **194** by the engagement of the outer surface of tabs **214** with the inner surface of the plurality of walls **200**. However, other alternative embodiments may secure the receiver housing lid **206** to the receiver housing **194** by other mechanical means such as bolts, screws, hinges, clasps, magnets, or the like.

As illustrated in FIG. **1**, the mounting system **10** may further comprise a wireless receiver **190** and an adapter **222**, each disposed within the receiver housing assembly **192**. FIG. **25** illustrates an exemplary representation of the wireless receiver **190**. The wireless receiver **190** may include a plurality of jacks **191**, for example, HDMI, RCA, USB, ethernet, 3.5-mm TRS, and an infrared port. For wireless connectivity, the wireless receiver **190** includes a radio and antenna for receiving and supporting OFDM-based wireless signals such as IEEE 802.11n 5 GHz LAN radio frequencies, which may include high definition video signals. The wireless receiver **190** generally has a range of approximately 131 feet. The wireless receiver **190** also supports various encryption algorithms, including, for example, 802.1x, 802.11i, WPA2, WPPA, and WEP 64/128 TKIP AES.

For video compression and distribution, the wireless receiver **190** includes full high definition 1080p (60 Hz) decoding with HDCP-compliant H.264 baseline profile at level 4.2. Upon receiving and processing an input signal, the wireless receiver **190** may output the signal through composite video, component video, or HDMI, providing video resolutions up to 1080p. The wireless receiver supports receiving and outputting both analog and digital audio, including AC-3 Dolby Digital 5.1 and DTS Digital Audio. In addition, the receiver is capable of less than 30 milliseconds latency of encoding-decoding in 1080p at 60 Hz during high definition video streaming and provides infrared blaster support. It should be recognized, however, that the precise wireless receiver **190** and its function and features may vary.

The receiver housing assembly **192** described above may be operatively connected to various types of mounting systems **10**. For example, the receiver housing assembly **192** may be operatively connected to fixed mounts or moveable mounts. Regardless of the type of mounting system **10** used, the receiver housing assembly **192** may be removable or non-removable from the mounting system **10**. FIGS. **1-8** illustrate one embodiment of a mounting system **10** comprising a receiver housing assembly **192** operatively connected thereto. As illustrated in FIGS. **1-8**, the mounting system **10** comprises a surface mount portion **100** operatively connected

to an arm assembly **130**, a device bracket **150** operatively connected to the arm assembly **130**, and an adapter bracket assembly **170** operatively connected to the device bracket **150**.

As illustrated in FIGS. **1**, **2**, and **7**, the surface mount portion **100** comprises a bottom surface track **102**, a top surface track **104**, and a surface plate **120**. The bottom surface track **102** and the top surface track **104** are each rectangular in shape with a surface side **106** and a device side **108**. Both the bottom surface track **102** and the top surface track **104** may include a plurality of primary openings **110** disposed on the surface side **106** for use in operatively connecting the bottom surface track **102** and top surface track **104** to a mounting surface such as a wall using fasteners such as screws, bolts, or the like. The bottom surface track **102** and the top surface track **104** may further comprise a plurality of secondary openings **114** for operatively connecting the surface plate **120** to the bottom surface track **102** and the top surface track **104**. It should be noted that, in various embodiments, the plurality of primary openings **110** are substantially horizontally spaced commensurate with standard wall stud spacing and may receive bolts, screws, or other connecting elements. Additionally, in various embodiments, the plurality of secondary openings **114** each comprise a substantially horizontal elongated slot to permit lateral adjustment of the surface plate **120**, as described in further detail below.

In one embodiment, the surface plate **120** comprises a relatively thin plate with a surface side **122**, a device side **124**, and a plurality of surface plate openings **126** for accepting bolts, screws, or other connecting elements. The surface plate **120** may be connected to the bottom surface track **102** and the top surface track **104** via the plurality of secondary openings **114** and the plurality of surface plate openings **126**. As best illustrated in FIG. **3**, the surface plate **120** may be connected "behind" the bottom and the top surface track **102** and **104** (e.g. adjacent to the mounting surface). In this configuration, the bottom surface track **102** and the top surface track **104** may further include a recess **107** on the surface side **106** corresponding at least to the thickness of surface plate **120** so that, once connected, the surface side of the bottom and the top surface track **102** and **104** may substantially contact the mounting surface. As depicted in FIG. **3**, the surface plate **120** may operatively connect to the bottom surface track **102** and the top surface track **104** via fasteners through the plurality of secondary openings **114** and the plurality of surface plate openings **126**. In this embodiment, because the plurality of secondary openings **114** comprises substantially horizontal elongated slots, the surface plate **120** may be adjusted laterally along the plurality of secondary openings **114**.

The surface plate **120** may further include one or more other apertures or recesses to receive portions of the mounting system **10** when in the retracted configuration. For example, a bracket aperture **127** may be included in the surface plate **120** to receive a portion of the device bracket **150** when the mounting system **10** is fully or partially retracted as shown in FIG. **3**. This feature reduces or eliminates a point of interference among components in the mounting system **10**, reducing the overall side profile of the mounting system **10** when fully retracted. Other alternative embodiments may include similar apertures or recesses to receive a portion of the arm assembly **130**.

In one embodiment, the arm assembly **130** comprises a surface end **137** movably connected to the device side **124** of the surface plate **120**. The arm assembly **130** may comprise one or more arms movably connected to one another. For example, in the depicted embodiment, the arm assembly **130** comprises a first arm **132**, a second arm **134**, and a third arm **136**. In this embodiment, the first and second arms **132** and **134** each include a first end **140** and a second end **142** distal the first end **140**. The third arm **136** includes a first end **144** proximate the second end **142** of the first and second arms **140** and **142** and a second end **146** distal the first end **144**. A pivot portion **148** is disposed proximate the first end **140** and the second end **142** of the first arm **132** and the second arm **134**, as well as at the first end **144** and the second end **146** of the third arm **136**. The pivot portions **148** disposed at the first end **140** of the first arm **132** and the second arm **134** are configured to movably connect the first and second arms **132** and **134** to the surface plate **120**. Similarly, the pivot portion **148** disposed at the second end **142** of the first arm **132** and the second arm **134**, as well as at the first end **144** of the third arm **136**, are configured to movably connect the first and second arms **132** and **134** to the third arm **136**. The pivot portion **148** disposed at the second end **146** of the third arm **136** is configured to movably connect the second end **146** of the third arm **136** to the device bracket **150**. Each of the pivot portions **148** may include a hollow portion for accepting an axle or pin. The arm assembly **130** is configured to permit movement of the device bracket **150** with respect to the wall or other surface. In particular, the pivot portions **148** connecting the first arm **132**, the second arm **134**, and the third arm **136** allow the first arm **132**, the second arm **134**, and the third arm **136** to nest within each other for a retracted position as illustrated in FIG. **2**. Similarly, the first arm **132**, the second arm **134**, and the third arm **136** can be extended outward from the surface to an intermediate orientation or a fully extended orientation.

The arms of the arm assembly **130** may generally comprise elongated members of a relatively thin construction to minimize the thickness of the mounting system **10** when fully retracted. It will be appreciated that the arms are sized to adequately support the anticipated weight of a mounted device in retracted, intermediate, and fully extended orientations.

In one embodiment, the device bracket **150** comprises a generally flat plate **151** having a top **152**, a bottom **153**, a surface side **154**, and a device side **155**. A pivot portion **156** may be connected to the surface side **154** of the device bracket **150**. At a device end **138** of the arm assembly **130** distal from the surface end **137**, the third arm **136** is movably coupled to the device bracket **150** via the pivot portion **156**. In addition to the movement afforded by the moveable connection between the third arm **136** and the device bracket **150** via pivot portion **156**, the device bracket is generally tiltable about a horizontal axis substantially parallel to the top horizontal adapter bracket **171** and about a vertical axis substantially parallel to the first vertical adapter bracket **178**. Various mechanisms for movably connecting the arm assembly **130** to the device bracket can be found in, for example, in U.S. Pat. Nos. 7,891,622, 7,866,621, 7,832,700, 7,753,332 and 7,641,163, the contents of which are incorporated herein by reference in their entireties.

In one embodiment, the adapter bracket assembly **170** is operatively connected to the device bracket **150** and comprises a top horizontal adapter bracket **171**, a bottom horizontal adapter bracket **172**, a first vertical adapter bracket **178**, and a second vertical adapter bracket **180**. The top horizontal adapter bracket **171** and the bottom horizontal adapter bracket **172** each include a first end **175** and a second end **176** distal the first end **175**. The top horizontal adapter bracket **171** includes a top device bracket mount **171**A and the bottom horizontal adapter bracket **172** includes a bottom device bracket mount **172**A. Each of the top and the bottom device bracket mounts **171**A and **172**A is configured to operatively connect to the device bracket **150**. Each of the top horizontal

adapter bracket **171** and the bottom horizontal adapter bracket **172** are elongated members comprising a lip **174** along the length and a plurality of openings **177**.

The first vertical adapter bracket **178** and the second vertical adapter bracket **180** may each include a first end **181** and a second end **182** distal the first end **181**. Each of the first vertical adapter bracket **178** and the second vertical adapter bracket **180** includes a hook **183** disposed at the first end **181** and the second end **182**. The hook **183** is configured to operatively connect to the top horizontal adapter bracket **171** and the bottom horizontal adapter bracket **172** as described below in detail. Each of the first vertical adapter bracket **178** and the second vertical adapter bracket **180** are elongated members comprising a plurality of openings **184**.

To assemble one embodiment of the adapter bracket assembly **170**, the top device bracket mount **171**A of the top horizontal adapter bracket **171** is affixed to the top **152** of the device bracket **150**, and the bottom device bracket mount **172**A of the bottom horizontal adapter bracket **172** is affixed to the bottom **153** of the device bracket **150**. The first vertical adapter bracket **178** and the second vertical adapter bracket **180** are operatively connected to the top horizontal adapter bracket **171** and the bottom horizontal adapter bracket **172** by engaging the hook **183** disposed at the first end **181** of the first vertical adapter bracket **178** and the second vertical adapter bracket **180** with the upper most lip **174** of the top horizontal adapter bracket **171** and engaging the hook **183** disposed at the second end **182** of the first vertical adapter bracket **178** and the second vertical adapter bracket **180** with the lower most lip **174** of the bottom horizontal adapter bracket **172**. The lateral location of the first vertical adapter bracket **178** and the second vertical adapter bracket **180** is adjustable along the length of the top and the bottom horizontal adapter bracket **171** and **172**. The first vertical adapter bracket **178** and the second vertical adapter bracket **180** may be fixed laterally by aligning one or more of the plurality of openings **184** on the first and the second vertical adapter bracket **178** and **180** with one or more of the plurality of openings **177** on the top and the bottom horizontal adapter bracket **171** and **172** and passing connecting elements through the openings.

As depicted in FIGS. **1-3**, the receiver housing assembly **192** is operatively connected to the second vertical adapter bracket **180** such that the second compartment **199** is oriented above the first compartment **197**. In one embodiment, an adhesive-backed magnet is affixed to one of the plurality of walls **200** of the receiver housing **194**, permitting the receiver housing assembly **192** to be operatively connected to the second vertical adapter bracket **180**. It should be recognized, however, that the specific position of the receiver housing assembly **192** may change in different embodiments. For example, other alternative embodiments may comprise operatively connecting the receiver housing assembly **192** to the device mount portion **149**, the surface mount portion **100**, the first vertical adapter bracket **178**, the top horizontal adapter bracket **171**, or the bottom horizontal adapter bracket **172**. Similarly, the specific orientation of the of the receiver housing assembly **192** may change in different embodiments. For example, in other alternative embodiments, the receiver housing assembly **192** may be oriented such that the first compartment **197** is oriented above the second compartment **199**. In addition, while an embodiment uses magnetic force to affix the receiver housing assembly **192**, other alternative embodiments may affix the receiver housing assembly **192** to the mounting system **10** by other types of mechanical fastening, such as bolts, screws, welding, zip ties, or the like. Finally, other alternative embodiments may comprise a receiver housing assembly **192** that is an integral component of the mounting system **10**. As one non-limiting example, such an alternative embodiment may comprise an adapter bracket assembly **170** comprising an integrally-formed receiver housing assembly **192**.

To contain the wireless receiver **190** and the adapter **222**, the wireless receiver **190** may be placed in the first end **201** of the receiver housing **194** and oriented such that the plurality of jacks **191** are located proximate to a cutout **205**, the cutout providing access to the plurality of jacks **191** and an outlet for connectors to be routed to a television. The adapter **222** is placed in the second end **203** of the receiver housing **194**. The receiver housing lid **206** is lowered onto the receiver housing **194** and is retained on the receiver housing **194** by engagement of the outer surface of tabs **214** with the inner surface of walls **200**. As described above, the aperture tab **220** extends into the compartment **195**, partitioning compartment **195** into the first compartment **197** and the second compartment **199**. The aperture tab **220**, thus serves to separate and confine the wireless receiver **190** and the adapter **222**.

FIG. **25** depicts an exemplary representation of a mounting system according to various embodiments, with the wireless receiver **190** operating within a broader wireless communication system **230** for wirelessly transmitting and receiving a signal from a media source **232**. The wireless communication system **230** includes the media source **232**, a power supply **234**, a transmitter **236**, a wireless receiver **190**, a plurality of connectors **238**, and a display **240**. The transmitter **236** is operatively connected to the media source **232** via one or more of the plurality of connectors **238**. The transmitter **236** is configured to receive an output signal from the media source **232** and to transmit a corresponding signal. The wireless receiver **190** is operatively connected to the display **240** via one or more of the plurality of connectors **238**. The wireless receiver **190** is configured to receive a signal transmitted from the transmitter **236** and to relay the signal to the display **240**. In one embodiment, the wireless receiver **190** may be mounted to the mounting system **10**, permitting the one or more of the plurality of connectors **238** connecting the wireless receiver **190** to the display **240** to be hidden behind the display **240**.

Upon receipt of an output signal from the media source **232**, the transmitter **236** processes and wirelessly transmits the signal. Upon detection of the transmitted signal, the wireless receiver **190** processes and relays the signal to the display **240**. Thus, by wirelessly transmitting the output signal of the media source **232** to a wireless receiver **190**, users do not need to route a cable between the media source **232** and the display **240**, permitting a clean installation.

FIGS. **26-33** depict another embodiment of the present invention, where a projector mounting system **300** includes a wireless housing module **310** for housing the wireless receiver **190**. As shown in FIGS. **26-31**, the projector mounting system **300** is configured to operatively attach to a projector **320** for exhibiting images, video, etc. on a projection screen, wall or similar surface. The projector mounting system **300** depicted in FIGS. **26-31** comprises a projector mounting assembly **330**, which couples to a surface of the projector **320**, and a projector adjustment assembly **340**, which may be used to adjust the orientation of the projector **320** in one or more of the pitch, yaw and roll directions.

Various types of projector mounting assemblies **330** and projector adjustment assemblies **340** are known in the art and are marketed, for example, by Peerless Industries of Aurora, Ill. The projector mounting assembly **330** depicted in FIGS. **26-33** comprises a base **350** having a periphery **360** disposed about the base **350**, and a plurality of arm assemblies **370** that are selectively locatable and connectable along the periphery

360. Each arm assembly 370 is configured with at least one connection portion 380 adapted to operatively couple to the projector 320. Each arm assembly 370 may further be selectively pivoted about an axis relative to the location where the arm assembly 370 is connected to the periphery 360. Additionally, each arm assembly 370 may also be selectively translated, extending and retracting the arm assembly 370 in a radial direction relative to the location where the respective arm assembly 370 is connected to the periphery 360. Coupling assemblies 390 may be implemented in operatively connecting the arm assemblies 370 to the base 350. The orientation of each arm assembly 370 and each connection portion 380 may be selectively fixed in relation to the periphery 360 via a respective coupling assembly 390. Each connection portion 380 may also be selectively translated in a direction substantially parallel to the pivot axis to accommodate coupling features of various elevations on the projector 320. Various exemplary projector mounting assemblies are discussed in detail in U.S. Publication No. 2010/0237210, entitled "Mounting System" and the contents of which are incorporated herein by reference.

As shown in FIGS. 26-33, the projector mounting system 300 further includes the wireless housing module 310 connected thereto. In the embodiment depicted in FIGS. 26-33, the wireless housing module 310 is coupled directly to the projector mounting assembly 330, but the wireless housing module 310 could instead be coupled to the projector adjustment assembly 340 in various embodiments. The wireless housing module 310 is configured to house and/or operatively connect to the wireless receiver 190 so that the wireless receiver 190 may be positioned in close proximity to the projector 320 with which the wireless receiver 190 communicates.

As best shown in FIGS. 32-33, the wireless housing module 310 according to one embodiment includes a housing structure 400 sized to surround and hold a portion of the wireless receiver 190. In the embodiment depicted in FIGS. 32-33, the housing structure 400 may be "opened" by removing a security fastener 420. The wireless receiver 190 is then placed within the housing structure, and the wireless receiver 190 is then secured within the housing structure by inserting the security fastener 420 into the housing structure 400.

A wireless module coupling mechanism 410 is operatively connected to the housing structure 400 and is used to connect the wireless housing module to the periphery 360 of the base 350. In one embodiment, a "clamping" action by the wireless module coupling mechanism 410 around the periphery 360 is used to selectively secure the wireless module coupling mechanism 410 to the periphery 360. However, other types of connection or coupling arrangements may also be used. Additionally, it is also possible for the wireless housing module 310 to be permanently secured to the base 350 in certain embodiments. Furthermore, it should be noted that the wireless housing module 310 may be coupled to a wide variety of projector mounting assemblies 330 or projector adjustment assemblies 340 in different embodiments.

FIGS. 34-36 depict a mounting system 500 for attaching a display device to a surface and housing a wireless receiver 505 for communicating a wireless signal to the display device in accordance with yet another embodiment. The mounting system 500 depicted in FIGS. 34-36 is similar in many respects to the mounting system 10 depicted in FIGS. 1-8. However, the mounting system 500 of FIGS. 34-36 also includes a power module assembly 510 operatively connected the rest of the mounting system 500. In this particular embodiment, the power module assembly 510 is connected to the remainder of the mounting system 500 via a device mount portion 515. As is the case above for the receiver housing assembly, however, this attachment could occur via other components of the mounting system 500 as well. The power module assembly 510 is sized and configured to house a power receptacle (not shown), for example of the type incorporated into the power cord of a flat panel television. By placing the power receptacle within the power module assembly 510, the power receptacle is secured in a safe position such that it is not simply hanging from the flat panel television, which would otherwise result in added stresses to the power cable and, over time, potential damage to the power cable and the flat panel television. The power module assembly 510 may also include space for housing excess power cabling from the display device and/or other electronic devices connected thereto.

The mounting system 500 depicted in FIGS. 34-37 also includes a first, second, third and fourth lateral adjustment members 530, 535, 540 and 545, respectively, that are configured to movably connect the power module assembly 510 and/or a receiver housing assembly 550 to a respective device mount portion 515. In the particular embodiment depicted in FIGS. 34-36, each of the first, second, third and fourth lateral adjustment members 530, 535, 540 and 545 possess the same configuration. However, it should be understood that both the number of lateral adjustment members and the configuration of each lateral adjustment member may vary.

Each of the first, second, third and fourth lateral adjustment members 530, 535, 540 and 545 depicted in FIGS. 34-36 possess a first lateral adjustment opening 555 through which a fastener 520 may pass through before engaging the respective device mount portion 515 (through an opening located therein or by other mechanisms known in the art). Each of the first, second, third and fourth lateral adjustment members 530, 535, 540 and 545 depicted in FIGS. 34-36 also includes a second lateral adjustment opening 560. In this particular embodiment, the second lateral adjustment opening 560 comprises a slot. The slot allows the lateral positioning of the power module assembly 510 and/or the receiver housing assembly 550 relative to connected device mount portion 515 to be adjusted. This provides an added benefit to an installer of the mounting system 500, as it permits him or her to place the receiver housing assembly 550 and or the power module assembly 510 in positions where there is an optimal clearance relative to the rest of the mounting system 500 and the attached audio/visual device as well as from environmental projections and obstructions emanating from the surface to which the mounting system 500 is mounted, associated cables and dongles, and other items.

The power module assembly 510 includes a power module assembly flange 570 extending therefrom. The power module assembly flange 570 includes one or more power module assembly flange openings 575 therein, each of which is sized and positioned to accept the same fastener 520 that passes through the associated lateral adjustment member 530 or 535. In the embodiment depicted in FIGS. 34-36, each power module assembly flange opening 575 comprises a slot. This provides even greater flexibility to the installer, permitting him or her to adjust the vertical position of the power module assembly 510 and or the individual lateral adjustment members 530 and 535 (when the longitudinal axis of the power module assembly flange openings 575 are oriented substantially perpendicular to the ground) in order to better avoid obstructions and the like. It should be noted, however, that rather than using power module assembly flange openings 575, however, other coupling mechanisms such as clamping devices may be used to couple the lateral adjustment members 530 and 535 to the power module assembly 510. The use

of multiple slots and other openings on the device mount portion **515** (which are also used for mounting the audio/visual device) provide further vertical flexibility in positioning the power module assembly **510**.

In the case of the receiver housing assembly **550**, the receiver housing assembly **550** includes a the receiver housing assembly flange **580** extending therefrom. The receiver housing assembly flange **580** includes a one or more receiver housing assembly flange openings **585** therein, each of which is sized and positioned to accept the same fastener **520** that passes through the associated lateral adjustment member **540** or **545**. In the embodiment depicted in FIGS. **34-36**, each receiver housing assembly flange opening **585** comprises a slot. This provides even greater flexibility to the installer, permitting him or her to just the vertical position of the receiver housing assembly **550** and or the individual lateral adjustment members **540** and **545** (when the longitudinal axis of the receiving housing assembly flange openings **585** are oriented substantially perpendicular to the ground) in order to better avoid obstructions and the like. It should be noted, however, that rather than using receiver housing assembly flange openings **585**, however, other coupling mechanisms such as clamping devices may be used to couple the lateral adjustment members **540** and **545** to the receiver housing assembly **550**. The use of multiple slots and other openings on the device mount portion **515** (which are also used for mounting the audio/visual device) provide further vertical flexibility in positioning the receiver housing assembly **550**.

FIG. **37** is an exploded view of the receiver housing assembly **550** of FIGS. **34-36** for use in housing the wireless receiver **505**. The receiver housing assembly **550** of FIG. **37** is similar in many respects to the receiver housing assembly **192** of FIG. **9**. However, the receiving housing assembly **550** of FIG. **37** also includes the aforementioned receiver housing assembly flange **580** extending from a receiver housing lid **590**. In the embodiment depicted in FIG. **37**, the receiver housing assembly flange **580** may be formed as a single piece with some or all of the receiver housing lid **590**. However, it is also possible for the receiver housing assembly flange **580** to be formed as a separate component which is then fastened or otherwise connected to the rest of the receiver housing assembly **550**.

The foregoing description of embodiments of the present invention have been presented for purposes of illustration and description. It is not intended to be exhaustive or to limit the present invention to the precise form disclosed, and modifications and variations are possible in light of the above teachings or may be acquired from practice of the present invention. The embodiments were chosen and described to explain the principles of the present invention and its practical application to enable one skilled in the art to utilize the present invention in various embodiments and with various modifications as are suited to the particular use contemplated.

What is claimed is:

1. A system for attaching a display device to a surface separate from the display device and housing a wireless signal receiver, comprising:

a surface mount portion configured to attach to the separate surface;

a device mount portion operatively connected to the surface mount portion, the device mount portion including a device mounting surface configured to attach to the separate display device; and

a receiver housing assembly configured to house the wireless receiver, the receiver housing assembly connected to one of a receiver housing assembly mounting surface of the device mount portion and a receiver housing assembly mounting surface of the surface mount portion.

2. The system of claim **1**, further comprising the wireless receiver completely disposed within the receiver housing assembly, the wireless receiver configured to communicate a high definition wireless signal.

3. The system of claim **1**, wherein the receiver housing assembly is removable from the one of the device mount portion and the surface mount portion.

4. The system of claim **1**, wherein the receiver housing assembly is not removable from the one of the device mount portion and the surface mount portion.

5. The system of claim **1**, wherein the receiver housing assembly comprises a receiver housing and a receiver housing lid, the receiver housing forming a compartment defined by a bottom and a plurality of walls extending therefrom, the receiver housing lid operatively engageable with the receiver housing.

6. The system of claim **5**, wherein the receiver housing includes at least one cutout in at least one of the plurality of walls, the at least one cutout configured to provide access to the wireless receiver disposed within the receiver housing assembly for routing connectors between the wireless receiver and a device that is separate from the system.

7. The system of claim **5**, wherein the receiver housing includes at least one receiver housing opening that is devoid of any portion of the system, thereby improving transmission strength of a wireless signal to the wireless receiver disposed within the compartment.

8. The system of claim **5**, wherein the receiver housing lid further comprises an aperture tab, wherein when the receiver housing lid is operatively engaged with the receiver housing, the aperture tab partitions the compartment into a first compartment and a second compartment, wherein the wireless receiver is completely housed within the first compartment, and wherein an adapter is completely housed within the second compartment.

9. The system of claim **1**, wherein the system is configured to mount a projector device to the surface.

10. The system of claim **1**, wherein the system is configured to mount a flat panel television to the surface.

11. The system of claim **1**, further comprising a power module assembly configured to house a power module configured to supply power to the separate display device when connected thereto, the power module assembly operatively connected to the device mount portion.

12. The system of claim **1**, wherein the position of the receiver housing assembly relative to the device mount portion is adjustable.

13. The system of claim **12**, further comprising at least one lateral adjustment member coupled to both the receiver housing assembly and the device mount portion, the at least one lateral adjustment member configured to permit a distance between the receiver housing assembly and the device mount portion to vary.

14. The system of claim **13**, wherein the receiver housing assembly includes a receiver housing assembly flange extending therefrom, and wherein the a fastener is used to couple the at least one lateral adjustment member to the receiver housing assembly via the receiver housing assembly.

15. A system for attaching a device to a surface and housing a wireless signal receiver, comprising:

a surface mount portion configured to attach to the surface;

a device mount portion operatively connected to the surface mount portion;

a receiver housing assembly configured to house the wireless receiver, the receiver housing assembly connected to one of the device mount portion and the surface mount portion; and

a power module assembly configured to house a power module configured to supply power to the device when connected thereto, the power module assembly operatively connected to the device mount portion,

wherein the power module assembly further includes a power module frame that is adjustable relative to the device mount portion and the surface mount portion, and wherein the power module is housed within the power module frame, such that the position of the power module is adjustable relative to the device mount portion and the surface mount portion when the power module is connected to the device.

16. The system of claim **15**, further comprising at least one lateral adjustment member coupled to an external surface of the power module frame of the power module assembly and to an external surface of the device mount portion, wherein the at least one lateral adjustment member is configured to permit a distance between the power module assembly and the device mount portion to be varied.

17. The system of claim **16**, wherein the power module frame includes a power module frame flange extending therefrom, and wherein a fastener is used to couple the at least one lateral adjustment member to the power module assembly via the power module frame flange.

18. A system for attaching an audio/visual device to a surface and housing a wireless signal receiver, comprising:

a surface mount portion configured to attach to the surface;

a device mount portion operatively connected to the surface mount portion; and

a receiver housing assembly configured to house the wireless receiver, the receiver housing assembly connected to one of the device mount portion and the surface mount portion;

at least one lateral adjustment member connecting the receiver housing assembly to the one of the device mount portion and the surface mount portion such that a distance between the receiver housing assembly and the device mount portion may be varied; and

a power module assembly including a frame that is configured to house a power module associated with the audio/visual device,

wherein the receiver housing assembly includes a receiver housing assembly flange extending therefrom,

wherein a fastener is used to couple the at least one lateral adjustment member to the receiver housing assembly via the receiver housing assembly, and

wherein the frame of the power module assembly is operatively connected to the device mount portion via another lateral adjustment member that allows the power module assembly to be moved laterally relative to the device mount portion when the power module is electrically connected to the audio/visual device.

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